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## NOTES ON CLIMATOLOGY.

BY

ROBERT DE C. WARD.

THE CLIMATE OF SAN FRANCISCO.—San Francisco has, in some respects, one of the most interesting climates in the United States, the most striking feature being the delay of the maximum monthly mean temperature beyond the middle of the summer into September. This results from the fact that the city lies at an opening in the coast range of mountains, through which there is a strong indraft of air from the Pacific towards the interior valley, while the latter is most warmed under the summer sun. This strong onshore wind prevents the temperature at San Francisco from reaching a maximum in midsummer, as is usually the case. The maximum monthly mean temperature is displaced into September, when the interior valley is less warmed, and when, therefore, the onshore wind at San Francisco is less strong, and its cooling effect less marked. *The climate of San Francisco* has been made the subject of a recent *Bulletin* (No. 28) of the United States Weather Bureau, prepared by A. G. McAdie, Local Forecast Official at San Francisco, and G. H. Willson. The rainfall data used in this discussion go back to 1849, while the temperature and other records begin in 1871. The Bulletin is chiefly made up of tabular matter, the discussion being limited to three pages out of 25. One could have wished for something in the way of a description of the seasonal weather types which go to make up the climate of San Francisco. Tables of climatic data, while of great importance, are dry and unattractive, and really convey little meaning to the average reader. The mean annual temperature of San Francisco is  $56.2^{\circ}$ . The warmest month is September, with  $60.9^{\circ}$ ; the coldest month is January, with  $50.1^{\circ}$ . The highest temperature on record is  $100^{\circ}$ , which was noted on June 29, 1891, and the lowest was  $29^{\circ}$ , on January 15, 1888. The annual rainfall is 23 inches. July and August are practically without rain, while December and January together have nearly 10 inches. The crop yield is largest when, other things being equal, rain falls generously in March and April.

RELATIVE HUMIDITY AS AN ELEMENT OF CLIMATE.—The importance of relative humidity in determining, together with temper-

ature, the degree of comfort or discomfort that is felt under different weather conditions, is a matter that is coming to be more and more recognized and discussed. Lancaster has recently published a paper in this connection, entitled *De la Manière d'utiliser les Observations hygrométriques* (Rapport lu au Vme Congrès International d'Hydrologie, de Climatologie et de Géologie médicales à Liège, 1898). As a result of a long series of personal observations made in Belgium, the author concludes that the heat there becomes very oppressive when, the temperature being about 86° F., the relative humidity reaches 40%. For lower temperatures the heat becomes very oppressive when the relative humidity rises above the following percentages for the given temperatures:

Temperature.....	84°	82.5°	80.5°-77°	75°-73.5°	71.5°-70°
Relative Humidity..	45%	50%	65%	70%	75%

In the case of Vivi, in the Congo Free State, the mean relative humidity with a temperature of 86° is 59%. In Belgium, the relative humidity, with that same temperature, averages 36%, and personal experience shows that if the relative humidity in Belgium rises to 40%, with a temperature of 86°, the heat is almost unbearable. This sort of investigation can readily be undertaken by any one, and offers opportunity for obtaining most interesting results.

KÖPPEN'S KLIMALEHRE.—One of the most useful little publications in the field of climatology is *Klimalehre*, by Dr. W. Köppen, of the Deutsche Seewarte, in Hamburg. (Leipzig, Sammlung Göschel, 1899. Small 8vo, pp. 122. Price 80 pfgs.) Hann's *Handbuch der Klimatologie*, a second edition of which, in three volumes, was issued in 1897, has been, since the publication of the first edition in 1883, and will for years remain, the standard publication on climatology. But Köppen's little book, with its small size and low price, will certainly make a place for itself. It sets forth the principles of climatology clearly and systematically, and will serve admirably for those who, having a good general knowledge of meteorology, wish to learn something of climatology as well. While all the chapters in the book are models of what a competent author can do in a very limited space, the last chapter is perhaps the best of all in this respect. In this chapter of 17 pages we are given an admirable discussion of the five climatic zones, the characteristics of each of these zones, and a suggestive, though necessarily very short, account of the relation of the zones to civilization.

LOSS OF LIFE BY LIGHTNING IN 1899.—Thunderstorms are one of the characteristic climatic phenomena of the United States, and the damage that is done by lightning is therefore a perfectly legitimate subject for comment in these NOTES. During the year 1899, 562 persons were killed outright by lightning in the United States, or else suffered injuries which resulted in death, as reported by Professor A. J. Henry in the *Monthly Weather Review* for March. The number of persons who received injuries varying in severity from slight physical shock to painful burns was 820. This loss of human life by lightning during the past year was greater than for any preceding year for which statistics have been collected. The greatest number of fatalities (45%) occurred in the open; the next greatest number (34%) occurred in houses; 11% occurred under trees, and 9% in barns.

THE EFFECT OF SEASONS UPON RAILROAD BUILDING IN ECUADOR.—The Government of Ecuador has lately granted a concession for the building of a railroad from Guayaquil to Quito, the capital of Ecuador. The latter city has hitherto been reached only by mule or horseback. There are many difficulties of construction to be encountered, but the building of the railroad is also much delayed by the rainy season. According to "El Progreso de Quito," as quoted in the *Bulletin of the Bureau of American Republics* for April, work on this road will not be carried on actively during the rainy season, owing to the fact that the majority of native laborers object to engaging in outdoor work during the winter, when they are exposed to torrential rains, and when, furthermore, the low temperatures in the Cordilleras are keenly felt.

THE WEATHER AND THE PRICE OF WHEAT.—Mr. R. C. Mossman, of Edinburgh, has recently published a paper on *The Price of Wheat at Haddington from 1627 to 1897*, which was read before the Scottish Society of Economists. The investigation is an interesting one, and brings to light some rather striking facts. The most extraordinary prices were in 1800 and 1812, heavy rains and a low August temperature being the chief causes in the first case. The high price in 1812 was due to a deficiency of the crop of 1811, without the means of obtaining any wheat from abroad. In 1879 there was a rise in price, which was the result of the extraordinary severity of the weather; and in 1891 the rise was due to a severe rye famine in Russia, and to the supply in the two preceding years being inadequate to meet the demand.